



## Teaching Guide

Identifying Data					2020/21
<b>Subject (*)</b>	Fundamentals of Electricity		<b>Code</b>	770G01013	
<b>Study programme</b>	Grao en Enxeñaría Electrónica Industrial e Automática				
Descriptors					
<b>Cycle</b>	<b>Period</b>	<b>Year</b>	<b>Type</b>	<b>Credits</b>	
Graduate	1st four-month period	Second	Obligatory	6	
<b>Language</b>	Spanish				
<b>Teaching method</b>	Hybrid				
<b>Prerequisites</b>					
<b>Department</b>	Enxeñaría Industrial				
<b>Coordinador</b>	Castilla Pascual, Consuelo de los L.	<b>E-mail</b>	consuelo.castilla.pascual@udc.es		
<b>Lecturers</b>	Castilla Pascual, Consuelo de los L.	<b>E-mail</b>	consuelo.castilla.pascual@udc.es		
<b>Web</b>	<a href="http://moodle.udc.es">http://moodle.udc.es</a>				
<b>General description</b>	<p>The fundamental aim of this asignatura is the training of the student so that it purchase the knowledge and can use the principles of the theory of circuits and the conocimiento of basic concepts of the machines electricas. By his compulsory character, this matter is fundamental in the training of the Engineer. It is related with all those of the Degree Electrical Engineering that work with electrical and electronic circuits, in particular with the asignatura Foundations of Electronics that gives in the following cuatrimestre and giving continuity for Circuits electricos of power, Electrical Installations, electrical Machines I and II of the third course, the optativa Technical of Acquisition of Electrical Measures and the ones of fourth course: Installations of Renewable Energies, Accionamiento of Electrical Machines and Transport of Electrical Energy. In the Degree of Industrial Electronic Engineering and automatic relates with the matter Foundations of Electronics of the following cuatrimestre, giving also continuity to electrical Systems of third course.</p>				



## Contingency plan

The asignatura configures in this educational guide like HYBRID, where only will give the classes expositivas, of session magistral, in model no face-to-face synchronous in Teams of form regulate the next course 2020/2021 (the interactive and of practices will be face-to-face); as in principle it foresees a number of students enrolled in her similar to the past course. Nevertheless, once known the number of students really enrolled in the asignatura to principle of course, if this number allows it will give the classes expositivas in FACE-TO-FACE model, model already planned, if they do not require apply contingencies, for the interactive of problems and of practices.

### CONTINGENCY PLAN:

#### 1. Modifications to the contents

- There will not be changes

#### 2. Methodologies

\*Teaching methodologies that are maintained

- Session magistral
- Readings (computes in the evaluation of the portafolios)
- objective Proof (computes in the evaluation 60%, structured in two proofs: 20% in partial examination and 40% in official announcement)
- Portafolios of the student (computes in the evaluation 20%)
- Solution of problems (with personalised Attention)
- Practical of laboratory (computes in the evaluation 20%) (with personalised Attention) his memory will value until the session of the practice that have done presencialmente, as they are 6 sessions of practices 20% delivers by the same between six, marking each one 3,33%. The remaining sessions of practices that require teaching no face-to-face (being able to require it all 20%) will evaluate by means of Works Tutelados of Practices.

\*Teaching methodologies that are modified

- Practical of laboratory (computes in the evaluation 20%) (with personalised Attention). Of the six sessions, each one of value of 3,33%, the realised presencialmente will value by means of his memory delivered weekly. The remaining sessions of practices that require teaching no face-to-face (being able to require it all 20%) will evaluate by means of the incorporation of Works Tutelados of Practices.
- Works Tutelados of Practices (compute in the evaluation until 20%, each corresponding activity to a session of Work tutelado of practices marks 3,33%) (with personalised Attention). The professor will propose in Moodle, a week if, another no, an asynchronous activity and individualizada to each member of small group, with circuits to simulate in Capture-CIS of Orcad-PsPice (program in version of students of free access in the network, the student will have of tutoriales in Moodle from beginning of course). The asynchronous activity of Moodle will open with some anteriority to the corresponding weekly session in Teams (this last for the follow-up and support in the realisation of the activity of "Trabajo Tutelado of Practices", will realise in the schedule that the EUP establish for the sessions of practices of the asignatura for the small groups), and the activity Moodle will close in the week in that it opens. In the following week will evaluate the activity delivered in Moodle. In the synchronous sessions of Teams: they will expose examples of simulation, possible problems that can present and will attend, on request of the student, concrete problems that have in the simulation of his practical activity assigned in Moodle. This dynamics will allow to do a follow-up adjusted to the needs of learning of the alumnado to develop the practices of simulation of circuits.

#### 3. Mechanisms for personalized attention to students

- Email: twice to the week in the schedule of tutorías established at the beginning of the cuatrimestre by the professor, so that the student that require it realise queries of tutorías or, if his doubt the precise, agree virtual meeting in Teams. The professor also can require to a concrete student that attend to session of tutoría.

- Forums of Moodle Thematic: daily attention from the opening of the forum until the closing of the participation in them, to expose and/or argue of form directed the difficulties and own subjects of the subject, will open to discussion once the subject was treated in session magistral or proposed his reading, available the participation for all the students of the big group according to the needs of the alumnado to the end of the following subject.
- Sessions in Teams, of Session Magistral, of Problems; each one of them once a week in the time band established in the calendar of the EUP for the asignatura. The one of Session Magistral in big group is for the advance of the theoretical contents of the matter, the one of Problems in average group for the advance in problems to include in the portafolios. Besides, sessions in Teams a week if and another no, for the advance in the know do of activities of Works Tutelados of Practise of Simulation, accompanied in his week, of asynchronous activity in Moodle for the delivery of work of simulation.

#### 4. Modifications in the evaluation

- Works Tutelados of Practices (compute in the evaluation until 20%, each corresponding activity to a session of Work tutelado of practices marks 3,33%).

In each work will value :

- Adecuación To the proposal of work.
- Presentation and clarity of the results.
- Designation of ?methods of help in the simulation? for the correct resolution.
- Time of delivery vs time limit of delivery.

\*Evaluation observations:

- The control of assistance only will realise with regard to the sessions in which there is presencialidad and until the moment in that it suspend the face-to-face activity.
- The objective proofs, already was partial or the official, will realise in synchronous session of Teams according to the calendar of examinations that establish the centre, at the same time that it will open the proof in Moodle to which will increase him the time to the double of the indicated in the guide, to take into account the move in her in digital format and have to go up to Moodle the scan or photo of the justifications to fist and letter.

#### 1. SITUATIONS:

To) Alumnado with complete dedication:

- minimum Assistance of 80% in classes of big and average groups and minimum participation of 80% of his activities.
- Assistance of 100% in classes of small groups and realisation of 100% of his activities.

B) Alumnado With dedication part time and dispenses academician of exemption of assistance:

- minimum Assistance of 80% in classes of big and average groups and minimum participation of 80% of his activities.
- Assistance of 100% in classes of small groups and realisation of 100% of his activities.

#### 2. REQUIREMENTS TO SURPASS THE MATTER:

- Assist and participate regularly (% indicated on the dot 1).
- Deliver the works tutelados before the limit of time established.
- Obtain a punctuation of 30% of the weight of the objective proof in official announcement.
- Obtain a punctuation of 50% of the weight in each one of the practical sessions.
- The criteria of evaluation in first and second opportunity are the same.

#### 5. Modifications to the bibliography or webgraphy

I do not realise changes, but facilitates the following listing for access to the version in electronic book:

Boylestad, Robert L. Electrónica : Teoría de circuitos y dispositivos electrónicos. Prentice Hall, 2009. Acceso:  
[http://kmelot.biblioteca.udc.es/record=b1695317~S1\\*gag](http://kmelot.biblioteca.udc.es/record=b1695317~S1*gag)

Hayt, William H. Análisis de circuitos en ingeniería. 8ª ed. México : McGraw-Hill, [2012] Acceso 7ºed.(2007):  
[http://kmelot.biblioteca.udc.es/record=b1642000~S1\\*gag](http://kmelot.biblioteca.udc.es/record=b1642000~S1*gag)

Queijo García, Gumersindo. Fundamentos de tecnología eléctrica. Madrid : UNED, 2018. Acceso:  
[http://kmelot.biblioteca.udc.es/record=b1669779~S1\\*gag](http://kmelot.biblioteca.udc.es/record=b1669779~S1*gag)

Oriol Boix. Tecnología eléctrica. Barcelona: Cano Pina, 2014 Acceso:  
[http://kmelot.biblioteca.udc.es/record=b1630355~S1\\*gag](http://kmelot.biblioteca.udc.es/record=b1630355~S1*gag)



Study programme competences / results	
Code	Study programme competences / results
A15	Coñecer e utilizar os principios da teoría de circuitos e máquinas eléctricas.
B1	Capacidade de resolver problemas con iniciativa, toma de decisións, creatividade e razoamento crítico.
B4	Capacidade de traballar e aprender de forma autónoma e con iniciativa.
B5	Capacidade para empregar as técnicas, habilidades e ferramentas da enxeñaría necesarias para a práctica desta.
C5	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben afrontarse.
C6	Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.
C7	Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.

Learning outcomes			
Learning outcomes		Study programme competences / results	
It knows the foundations of the theory of circuits and of the electrical machines		A15	B1 B4 B5 C5 C6 C7
It comprises the principles of the theory of circuits and of the electrical machines and has skill to apply them to the analysis of simple problems of electrical circuits and of electrical machines.		A15	B1 B4 B5 C5 C6 C7

Contents	
Topic	Sub-topic
Circuits, laws and elements.(Contents: Analysis of circuits. Elements of circuits. Laws of Kirchhoff).	Theory of circuits. Introduction. Elements of circuits. Introduction to the topological analysis.
Analysis of circuits. Examples in DC.(Contents: Analysis of Circuits, basic Methods of analysis. Fundamental theorems).	Generalisation of the association of passive elements. Methods of analysis. Fundamental theorems.
Analysis of circuits in AC.(Contents: Diet estacionario sinusoidal. Basic methods of analysis. Fundamental theorems).	Simple circuit in sinusoidal permanent diet. Validity of the methods of analysis and of the fundamental theorems. Examples. Power and energy in AC
Systems trifásicos.(Contents: Introduction to systems trifásicos).	Analysis of the circuit trifásico. Power in the systems trifásicos.
Introduction to the electrical machines.(Contents: Introduction to the electrical machines).	Máquinas estáticas y rotativas.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A15 B4 C5 C6 C7	21	31	52
Workbook	A15 B1 B4 B5 C5 C6 C7	0	3	3
Objective test	A15 B1 B4 B5 C5	2	13	15
Laboratory practice	A15 B1 B5 C5 C6	9	6	15
Student portfolio	A15 B1 B4 B5 C5 C6 C7	0	10	10
Problem solving	A15 B1 B4 B5 C5	21	31	52



Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Theoretical oral exhibition-practises of the chapters of the program that realises to transmit knowledges, complemented with the use of multimedia audiovisual/means. In the case of subjects compendio of theoretical definitions requested the reading like personal work of the student and will give a day and time to resolve the doubts. To end to facilitate the learning will pose questions and recommended readings of which will deduce the answers so that they appear in the student portafolio.
Workbook	Personal work of the student on distinct contents of the signatura. During the course requested the reading of subjects compendio of theoretical definitions and formulated questions recommending readings to find his answer.
Objective test	The proof of final evaluation written of practical character, on the contents of the matter. It will consist in the solution of ten exercises.
Laboratory practice	Realisation of diverse settings of electrical circuits in softwares of simulation that illustrate the results obtained in the theoretical classes and of problems. The student will have in the platform Moodle of the leaves of takings of data yes like videos complement to the practices. The student will realise the understanding reading of the practice, took data and will resolve the calculations asociated and the questions that pose , in some cases will check the resolution of the circuit by means of the use of simulation tool Orcad Pspice Lite. In the final memory the student will value the result obtained.
Student portfolio	It consists in a notebook of the work of character fundamentally practical, that collect so much the exercises realised in class like the personal work realised by the student in the exercises that poses the professor so that they are in the portafolio. The justification of the solution of an exercise will accompany with theoretical annotations that the professor resalte in the class. Also they will include the theoretical questions that indicate , with the answers that the student deduce of the readings recommended by the professor to such effect.
Problem solving	Seminars in groups of intermediate size allocated to resolve exercises and problems. Posed with antelación or in the same day. It will deliver with antelación the billed of problems that have to form part of the notebook of work whose solution correspond to develop by part of the student. During the session will resolve the doubts or difficulties that have arisen.

Personalized attention	
Methodologies	Description



Objective test Laboratory practice Problem solving Workbook Student portfolio Guest lecture / keynote speech	<p>During the session magistral will attend the doubts in the transcurso of the class or if it was necessary emplazará to the student to tutorial.</p> <p>The doubts that arise in the readings recommended will be able to resolve in the tutorial.</p> <p>During the objective proof, the professor will attend to the student that call it in the place of examination of the student.</p> <p>In the practices, the personalised attention will realise in the transcurso of the sessions, well to initiative of the student to clear and answer his doubts, or to initiative of the professor with the end to improve the interest and attitude of the student.</p> <p>The notebook, portafolios of the student, will ask it the professor during the classes, to go seeing the advance in the same and will indicate to the student the sections that has to improve to guide it and encourage it. In each delivery will have to be like minimum the exercises of the previous day. At least they will do two deliveries. The student will be able to consult in tutorías the doubts that pose him in front of the indications of the professor.</p> <p>They will attend the doubts in the transcurso of the class in average group for the solución of problems, if it was necessary emplazará to the student to tutorial.</p> <p>In the schedule established by the professor for the tutorías, the student that attend to individual title will be able to pose the doubts that arise him in the study of the matter, or in the development of the solution of an exercise. The student that attend to the tutoría, will have to present the text consulted object of doubt or the development realised in the research of the solution of the exercise that goes out. Also the professor will be able to summon personally to the alumnado if like this it estimated it.</p>
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Assessment			
Methodologies	Competencies / Results	Description	Qualification



Objective test	A15 B1 B4 B5 C5	<p>60% delivers in:</p> <p>20% that corresponds to an objective proof of three items to realise in class of length 30 minutes, after the first delivery of the student portfolio.</p> <p>The remaining 40% corresponds:</p> <p>To the final examination (already was the one of the official announcement of first opportunity in January or the official announcement of second opportunity of Julio) will be of ten or five Items: questions in shape of short problems of several concepts. For some Items will propose several answers, where only one is possible. The student will have to justify the answer chosen and because descarta the remaining. A item only can cost a point or zero. The item very justified explains a point. The evil justified or without justifying do not explain.</p> <p>The length of the examination will be of 2h (10 Items) or 1h (5 Items), expandable for the student that have adaptation to the diversity that estimate additional time established by the service ADI of the UDC.</p> <p>The punctuation obtained will contribute to the final qualification in 40%, as long as they surpass the three points on 10 in her, that is to say, reach the addend with percentage already applied of 1,2 points (30% of his weight of 4 points as adding).</p> <p>In case of not surpassing in the final examination the three points on ten, the final qualification will be ?Suspenso? with the punctuation reached in this proof independently of the reached in the others two methodologies.</p> <p>In case of not to present to objective proof of official announcement, final examination, the final qualification will be of ?No presented?.</p>	60
Laboratory practice	A15 B1 B5 C5 C6	<p>The practical sessions in laboratory are of forced assistance, indispensable to be able to approve the asignatura. It took note of the assistance. The teaching of laboratory is a complement to the theoretical classes, in them will propose exercises of application of the theory. It will value the understanding of the work of laboratory and the active participation by means of questions to the student in the transcurso of the practices. It will deliver a final memory of the practices realised. His weight of 20% delivers by the same between the six practices and it is necessary to reach in each one minimum 50% of his weight.</p> <p>The punctuation of each practice, already applied his % of weight (addends in final note), will be of Bad (M) or No realised (NR) (assigning 0 points), Surpassed (S) ( 0,167 points) or Well (B) (0,25) or Very Very (MB) (0,333). Punctuation only applicable in the academic course in that they realise said practical (ordinary announcements-January and extraordinary-Julio).</p> <p>The practices surpassed in the previous course only are valid ?convalidables?= CV) during the present course keeping his punctuation transforming it of 15% weight that had to 20% current weight.</p>	20





Student portfolio	A15 B1 B4 B5 C5 C6 C7	Each exercise will have to be clearly separated of the following, have his billed with his data, diagrams and questions. In the development of the solution, the magnitudes employed, have to indicate of clear form in the electrical circuit and will take into account all the theoretical annotations of interest that the student collect of the indicated in class. It will value the reading by means of the answers to the theoretical questions. The fault of some exercise, his development or the no delivery will do that the notebook do not mark in the final delivery. The professor anytime will be able to ask the delivery of the notebook. The punctuation will be, an addend in the final note, with % of the already applied weight, of Bad (M) or No realised (NR) (0), Regulate (R) (1 point) or Well (B) (1,5 points) or Very Very (MB) (2 points), contributing thus as already it has said to the qualification in 20%.	20
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### Assessment comments

The final qualification will give with a decimal and will be:

- If in the objective proof final three or more points on 10, as long as they are surpassed the practices:

Punctuation of the student portfolio\*0,20 punctuation of the practices surpassed (R, B or MB)\*0,20 punctuation tests objective\*0,40(if more than three points on 10) punctuation of the partial objective proof\*0,20 if the assistance was to regulate (upper to 80%) along the course.

To surpass the asignatura in the official announcements is necessary to have a final qualification of 5 on ten or upper,in the sum of all these addends.

- If in the objective proof final less than three points:

Punctuation of the objective proof final.

- If it does not present to the objective proof final:

No presented

- If they do not surpass the practices:

Punctuation in the practices if they realised, surpass or no the objective prooffinal, and if they did not realise punctuation of the objective proof final with already applied his percentage of weight.

### Sources of information



<p><b>Basic</b></p>	<ul style="list-style-type: none"> <li>- 7. Usaola García, J. (2002). Circuitos eléctricos: problemas y ejercicios resueltos.. Madrid: Prentice Hall</li> <li>- 8. Gerrero Fernandez, Alberto (1995). Electrotecnia. Madrid: MacGraw-Hill</li> <li>- 4. Fraile Ardanuy, J. (2004). Problemas resueltos de electromagnetismo y circuitos eléctricos.. Madrid : Colegio de Ingenieros de Caminos, Canales y Puertos, Servicio de Publicaciones</li> <li>- 5. Fraile Mora, L.I. (2004). Electromagnetismo y circuitos eléctricos.. Madrid: MacGraw-Hill</li> <li>- 3. Eguiluz Morán, Luis I.. (2001). Pruebas objetivas de circuitos eléctricos. Madrid: EUNSA</li> <li>- 1. Boylestad, R. L. ( 2009). Electrónica: teoría de circuitos y dispositivos electrónicos . Naucalpán de Juárez : Prentice Hall</li> <li>- 2. Eguiluz Moran, Luis I. (1997). Pruebas objetivas de ingeniería eléctrica.. Santander, T.G.D.S.L.</li> <li>- 6. Ras i Oliva, Enric. (1987). Teoría de circuitos fundamentos. Barcelona [etc.] : Marcombo, D.L.</li> <li>- 7. Queijo García, Gumersindo (2018). Fundamentos de Tecnología Eléctrica. Madrid: UNED</li> </ul> <p>BÁSICA: 1. Boylestad, R. L.Electónica: teoría de circuitos y dispositivos electrónicos / Robert L. Boylestad, Louis Nashelsky. 10ª ed. Naucalpán de Juárez : Prentice Hall, 2009.SIGNATURA: BR ET 30 2. Eguiluz Moran, Luis I. Pruebas objetivas de ingeniería eléctrica. [Santander] : T.G.D.S.L., [1997] SIGNATURA: BR EL 34 3. Eguiluz Morán, Luis I.. Pruebas objetivas de circuitos eléctricos. Madrid: EUNSA, 2001SIGNATURA: BR EL 14 4. Fraile Ardanuy, J.Problemas resueltos de electromagnetismo y circuitos eléctricos.Madrid : Colegio de Ingenieros de Caminos, Canales y Puertos, Servicio de Publicaciones, 2004SIGNATURA: BR EL 46 5. Fraile Mora, L.I.Electromagnetismo y circuitos eléctricos.4ª ed. Madrid: MacGraw-Hill, 2005SIGNATURA: BR EL 15 6. Ras i Oliva, Enric. Teoría de circuitos fundamentos. 4ª ed. renovada. Barcelona [etc.] : Marcombo, D.L. 1987SIGNATURA: BR EL 47 6. Usaola García, J.Circuitos eléctricos: problemas y ejercicios resueltos.Madrid: Prentice Hall, 2002SIGNATURA: BR EL 41 Otros libros de interés: * Hayt, Kemmerly, Dubrin (2002). Análisis de Circuitos en Ingeniería. Madrid. McGraw-Hill * W. Nilson, Ana Riedel (2001). Circuitos Eléctricos. Prentice Hall * Bruce Carlson (2002). Teoría de Circuitos. Madrid. Thomson * Parra V., Ortega J., Pastor A., Pérez A. (1992). Teoría de Circuitos.Tomos I y II. Madrid. U.N.E.D * Boix, Oriol(2009). Tecnología Eléctrica. Cano Pina S.L. Ediciones Ceysa</p>
<p><b>Complementary</b></p>	<p>Otros libros de interés: * Hayt, Kemmerly, Dubrin (2002). Análisis de Circuitos en Ingeniería. Madrid. McGraw-Hill * W. Nilson, Ana Riedel (2001). Circuitos Eléctricos. Prentice Hall * Bruce Carlson (2002). Teoría de Circuitos. Madrid. Thomson * Parra V., Ortega J., Pastor A., Pérez A. (1992). Teoría de Circuitos.Tomos I y II. Madrid. U.N.E.D * Boix, Oriol(2009). Tecnología Eléctrica. Cano Pina S.L. Ediciones Ceysa</p>

## Recommendations

### Subjects that it is recommended to have taken before

Calculus/770G01001  
 Linear Algebra/770G01006  
 Physics II/770G01007

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

Electric Machines I/770G02021  
 Electric Installations low voltage/770G02022  
 Electrical power circuits/770G02023  
 Power Stations/770G02024  
 Electric Machines II/770G02026  
 High-voltage electrical installations/770G02027  
 Installations of Renewable Energies/770G02033  
 Electric Machines and Drives/770G02035  
 Electric Energy Transport/770G02036  
 Acquisition techniques of electrical measurements/770G02030  
 Electromagnetic Compatibility in industrial installations/770G02039  
 Efficient management of electric power/770G02040



## Other comments

They are necessary previous knowledges of: electromagnetism, linear systems, differential equations, complex calculation and vectorial representation. As it indicated&nbsp; in the general description, the asignatura is related with all those of the Degree Industrial Electrical Engineering and Automatic that work with electrical and electronic circuits, in particular with the asignatura Foundations of Electronics that gives&nbsp; in the following cuatrimestre and giving continuity for Electrical Circuits of Power, Installations, electrical Machines I and II of the third course and other optativas and of fourth course.

**(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.**